

Docket No.: 713-488

PATENT

In re Application of

Ian Karl JONES

Serial No. Not yet assigned

Filed: April 5, 2001

For: PROTECTIVE PACKAGING SHEET

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:  
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:  
: Group Art Unit: Not yet assigned  
:  
: Examiner: N/A



**CLAIM OF PRIORITY AND**  
**TRANSMITTAL OF CERTIFIED PRIORITY DOCUMENT**

Assistant Commissioner For Patents  
Washington, D.C. 20231

Dear Sir:

In accordance with the provisions of 35 U.S.C. 119, Applicant hereby claims the priority  
of:

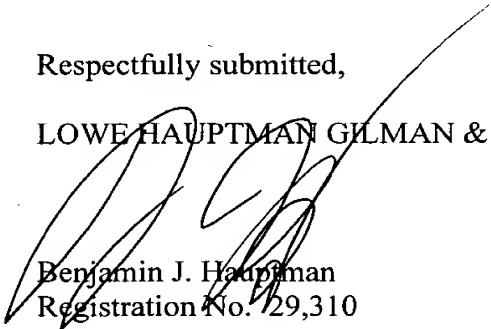
**Great Britain Patent Application No. 0008538.1 filed April 6, 2000**

cited in the Declaration of the present application.

The certified copy will be submitted in due course.

Respectfully submitted,

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Date: April 5, 2001

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10/2/01



INVESTOR IN PEOPLE

The Patent Office  
Concept House  
Cardiff Road  
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South Wales  
NP10 8QQ



I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

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Signed *Andrew Gentry*  
Dated 14 March 2001

# Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

-6 APR 2000

The Patent Office

Cardiff Road  
Newport  
South Wales  
NP9 1RH

1. Your reference	SNR06817GB		
2. Patent application number (The Patent Office will fill in this part)	0008538.1		- 6 APR 2000
3. Full name, address and postcode of the or of each applicant (underline all surnames)	ITW Limited PO Box 87 Queensway Fforestfach Swansea SA5 4ED		
Patents ADP number (if you know it)			
If the applicant is a corporate body, give the country/state of its incorporation	5275C7006		
4. Title of the invention	PROTECTIVE PACKAGING SHEET		
5. Name of your agent (if you have one)	Gill Jennings & Every		
"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)	Broadgate House 7 Eldon Street London EC2M 7LH		
Patents ADP number (if you know it)	745002		
6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number	Country	Priority application number (if you know it)	Date of filing (day / month / year)
7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application		Date of filing (day / month / year)
8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if: a) any applicant named in part 3 is not an inventor, or b) there is an inventor who is not named as an applicant, or c) any named applicant is a corporate body. See note (d))	YES		

PROTECTIVE PACKAGING SHEET

5 This invention relates to packaging materials and in particular, though not solely, to embossed sheet material used in packaging heavy loads such as large metal coils or rolls or stacks of rectangular cut sheet metal.

10 In order to avoid or minimise damage to heavy loads such as cold rolled steel coils during transportation and storage, specialised packaging solutions are required. In the case of steel coils, the extreme weight (up to around 20 tonnes) over a surface contact area as small as  $0.5\text{m}^2$  makes it difficult to meet the desirable requirement of maintaining separation between the ground and the steel to avoid corrosion during storage. The packaging material  
15 should also be puncture resistant, have a high impact strength and resistance to compression under the weight of a coil. It would also be beneficial for the packaging material to be recyclable, cheap to produce and manageable (light weight and easily worked into position around a  
20 coil).

Currently, there are a number of alternative materials used in packaging steel coils. Some manufacturers package their steel coils in steel or hard fibre hardboard, usually held together with steel straps. The steel coil may be (but  
25 is not always) shipped on a wooden pallet either with the axis of the coil vertical or horizontal. Some steel coils are wrapped in sheets of paper, such as kraft paper, plastics stretch wrap or a tear resistant plastic material (such as polyethylene or polypropylene) having one or more  
30 layers, sometimes with at least one layer being impregnated with a corrosion inhibitor (see for example US-A-5983598). However these materials offer insufficient protection and padding beneath the steel. Laminated polyethylene/polypropylene (see for example US-A-5928770) has also been  
35 suggested as a packaging material for steel coils however the manufacturing costs for this material would be prohibitive.

between the front and rear surfaces of the packaging sheet is less than or equal to about 5 times the thickness of the thermoplastics sheet from which it is formed.

Preferably the gaps between the shaped protuberances  
5 are filled with insulating foam.

Preferably a thin sheet is laminated to the furthestmost projecting sections of either or both of the front and rear surfaces.

Preferably the at least one intermediate layer is  
10 filled with insulating foam.

Particular embodiments of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 is a plan view from above of a portion of the  
15 protective packaging sheet according to a particular embodiment of the present invention;

Figure 2 is a plan view from below of the protective packaging sheet shown in Figure 1;

Figure 3 is a cross-sectional side elevation of the  
20 protective packaging sheet of Figure 1 through the line A-A;

Figure 4 is a cross-sectional side elevation of the protective packaging sheet of Figure 1 through the line B-B;

Figure 5 is a schematic flow diagram showing the main  
25 steps in producing the protective packaging sheet of Figure 1;

Figure 6 is a cross-sectional view similar to Figure 3 through a packaging sheet according to an alternative  
30 embodiment of the present invention;

Figure 7 is a cross-sectional view similar to Figure 4 through the packaging sheet of Figure 6;

Figure 8 is a cross-sectional view similar to Figures 3 and 6 through a packaging sheet according to a further  
35 alternative embodiment of the present invention; and

Figure 9 is a cross-sectional view similar to Figures 4 and 7 through the packaging sheet of Figure 8.

Although not essential, it has been found that the physical properties (for example resistance to bending and increased rigidity) of the packaging sheet are improved by providing connecting webs 6 between adjacent shaped protuberances 5. The shaped protuberance 5 could also be considered to include the connecting webs. Effectively, the connecting webs resist bending of the packaging sheet by resisting compressive or tensile forces acting along them. Accordingly, it is preferred that some connecting webs be provided at least both in a lateral direction and also in a direction perpendicular to the lateral direction. It can be seen in the cross-sectional views of Figures 3 and 4 that the connecting webs extend only substantially midway between the front 2 and rear 3 surfaces and thereby form a middle level between the two surfaces.

As previously mentioned, the embodiment shown in Figures 1 to 4 has been designed so that it may be used with either surface contacting the load to be packaged. This avoids accidental incorrect usage of the packaging sheet and is possible because the contact surface area of the front and rear surfaces is about the same and has been achieved by the combination of the spacing, size and juxtaposition of the shaped protuberances 5. As the connecting webs 6 do not project out from the surface of the sheet as far as the "T" shaped protuberances, they do not contribute to the contact surface area of either front or rear surface.

The stiffness of the packaging sheet according to the invention is much greater than the stiffness of the plastics sheet from which it is formed. This is in part due to the connecting webs but mainly due to the positioning of the shaped protuberances 5. It has been found that positioning the shaped protuberances 5 such that any straight line (a potential crease, tear or bending line) must cut through the shaped protuberances (in addition to the gaps between the shaped protuberances) increases the resistance of the packaging sheet to bending. This is

cooling or breaking during deformation. Where the plastics sheet is formed "on site" it is anticipated that the sheet will be sufficiently heated during formation to allow suitable moulding to take place without the need for additional heating. It has been found that the thickness of the finished packaging sheet should be less than or equal to about 5 times the thickness of the plastics sheet from which it is formed, any thicker and the desired structural properties are not maximised and there is a risk of damaging the plastics sheet.

Once heated, the plastics sheet is then passed between two embossing rollers 22 and 23 which rotate in opposite directions. At least one of the embossing rollers is provided with a solid embossed surface pattern while the other roller may either be provided with the inverse solid embossed surface pattern (that is, male and female rollers to produce a packaging sheet with an embossed pattern and a constant cross-sectional thickness), a solid cylindrical surface or may be covered in a soft "rubberised" material which will effectively deform to the contours of the embossed roller to follow the embossed roller's pattern. Accordingly, the packaging sheet may be produced with only one side embossed and the other flat (which is not preferred as the sheet then has a preferred orientation), both sides embossed with different patterns or both sides embossed with one side being the inverse of the other.

As the embossing rollers are operated their temperature will increase and it may be necessary to provide a cooling system to the rollers to keep them within a suitable operating range. The preferred operating temperature range of the embossing rollers 22 and 23 is below the temperature of the plastics sheet so that the plastics sheet is cooled and the pattern "frozen" into the plastics sheet upon contact with the rollers.

The width of the plastics sheet and the packaging sheet formed therefrom could be the same as the width of embossing rollers 22 and 23. Alternatively, the length of

In order to further improve the thermal resistance and structural properties of either embodiment of the packaging sheet, a thin plastics (for example polyethylene or polypropylene) sheet 31, 32 could be laminated to either the front and/or rear surface thereby trapping a layer of substantially stagnant air between the packaging sheet and the thin plastics sheet(s) as shown in Figures 8 and 9. Alternatively the space between the sheets could be filled with a suitable insulating foam. A further alternative is shown in Figures 6 and 7 without the additional thin plastics sheet but wherein insulating foam 30 fills the depressions in surface 3 of the packaging sheet so that surface 3 is now effectively flat. Of course, the depressions in surface 2 could alternatively or additionally be filled with foam to flatten surface 2.

By including a flat surface, these embodiments provide a convenient surface on which information or advertising may be printed. Furthermore, by trapping air or foam between the embossed sheet and the thin laminated sheet, the compression and impact resistance and thermal insulating properties of the packaging sheet are improved.

Accordingly, at least in the particular embodiments described, the present invention provides a lightweight, durable, rigid and tough packaging material. The packaging sheet according to some embodiments of the invention may also easily be cut and is recyclable.



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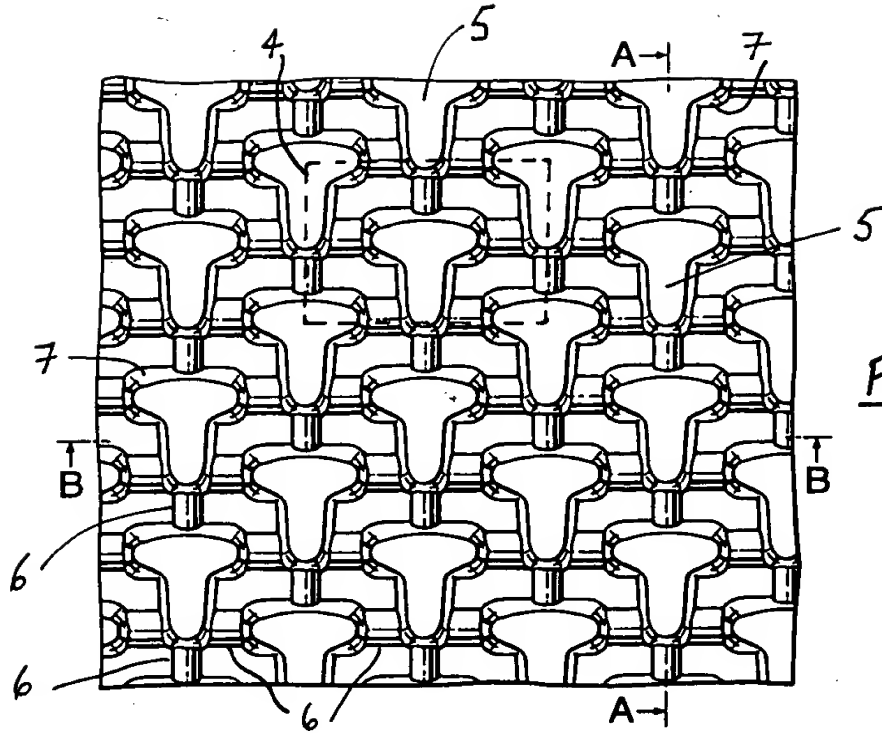


FIG 1

1

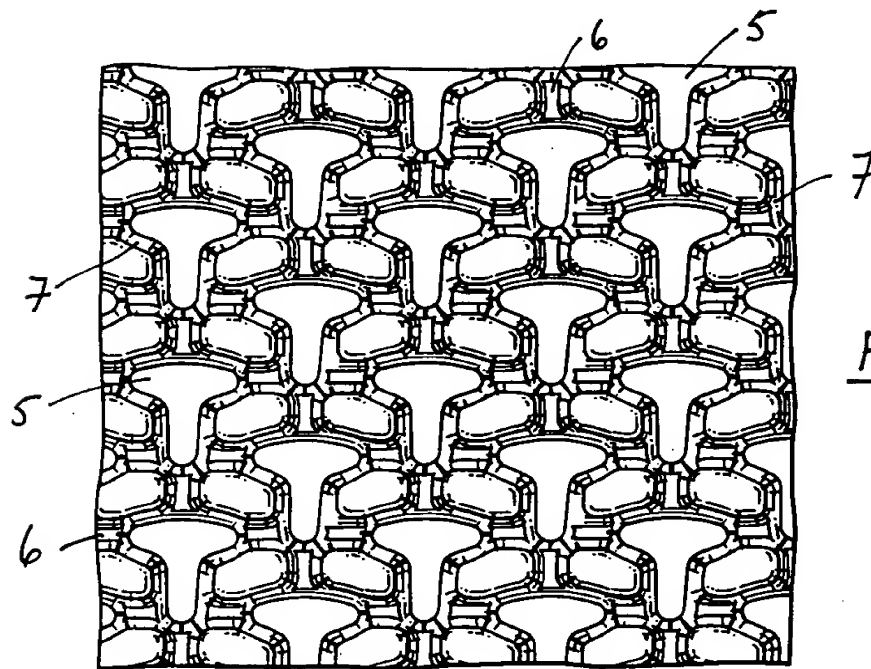


FIG 2

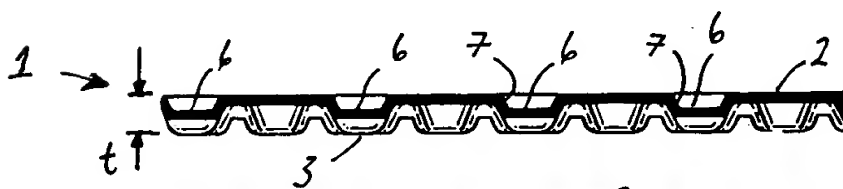


FIG 3

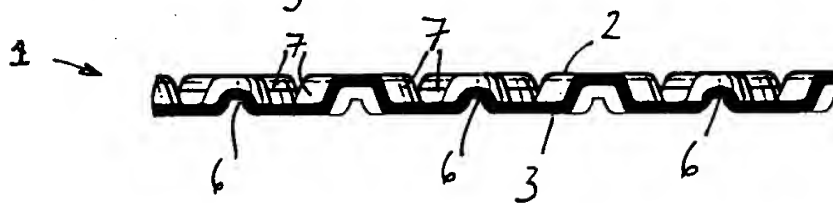


FIG 4



FIG 8



FIG 9

FIG 5

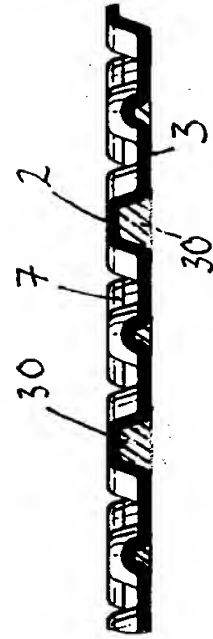
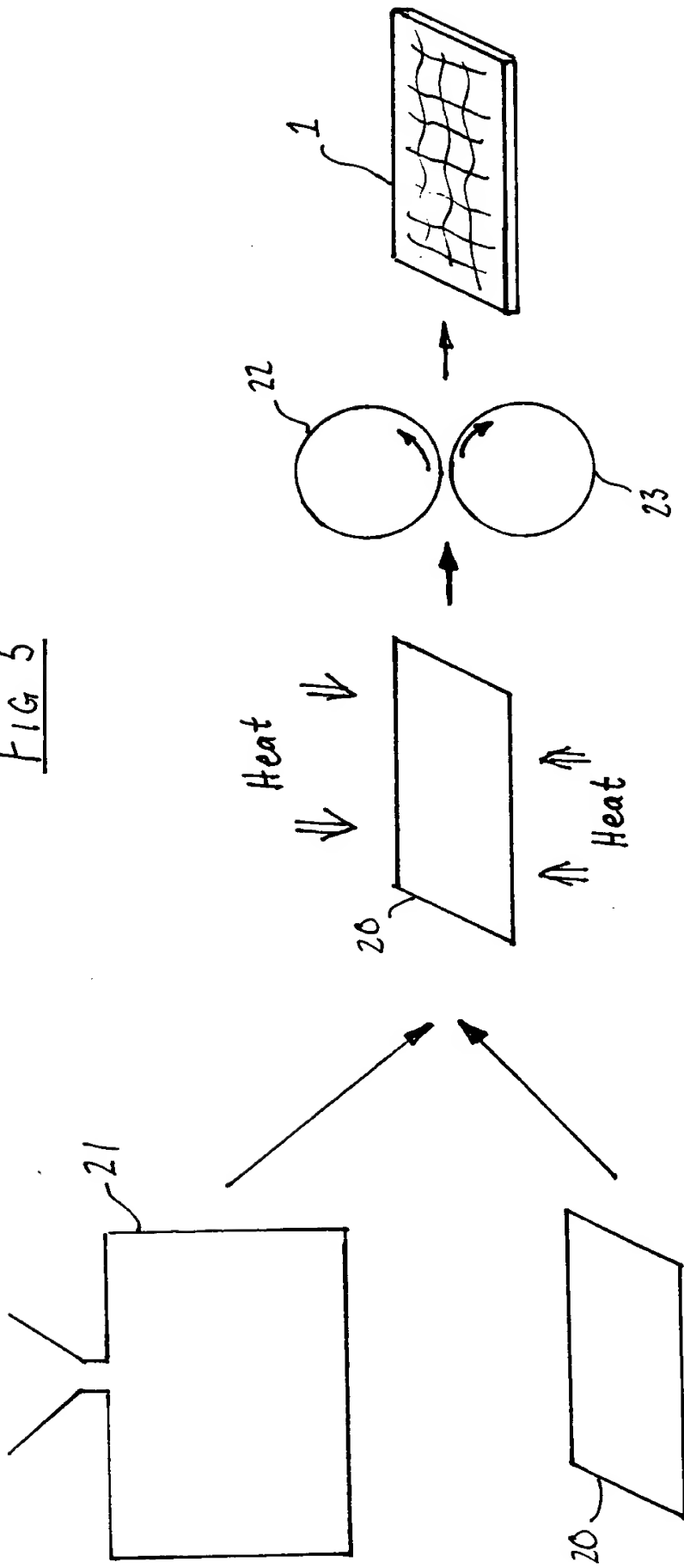


FIG 7

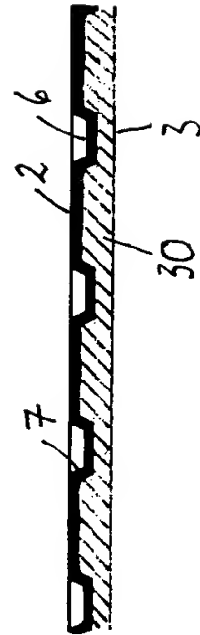


FIG 6